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Monthly Report

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[redacted]

CONTACT DUPLICATING & RESEAU PRINTER

AND

HIGH RESOLUTION STEP & REPEAT PRINTER

First Monthly Letter Report

August 10, 1964

Period: July 1, 1964 to August 1, 1964

[redacted]

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Complete

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1. CONTACT DUPLICATING AND RESEAU PRINTER

1.1 Purpose

The purpose of this effort is to design, fabricate, test, and deliver in fifteen months a high-speed, maximum resolution, minimum distortion, Step and Repeat Duplicating and Reseau Printer. Results of the initial feasibility study will lead to a Design Plan, followed by fabrication, test, and delivery of the final Printer. The deliverable equipment will be suitable for operational use. It will accommodate films of 70mm to $9\frac{1}{2}$" in width with format lengths up to 30 inches, and offer operation in the Reseau mode as an option.

1.2 Activity of this Report Period

In accordance with proposal B64-100, a fixed price sub-contract is being finalized with the [redacted] for the design and development of this printer. [redacted] purchase order has been issued to [redacted] to get them started. [redacted] will maintain tight project monitoring and will perform independent research in support of this program as necessary. The sub-contract has been submitted to the Contracting Officer for approval.

An engineering task force has been established. Various tasks have now been assigned and inputs are being received for the Feasibility Study Report. A PERT diagram has been generated and manpower loading charts have been prepared.

On July 24, 1964, a meeting was held in Washington with the cognizant technical contract monitors. A number of technical decisions were reached and problem areas were discussed. Samples of contact prints from typical Reseau lines of 7 to 25 microns were displayed and discussed.

A schedule of monthly Design Review meetings has been initiated to insure adequate liaison between [redacted] and the technical monitors. Constant liaison between [redacted] and [redacted] will be maintained.

1.3 Plans for Next Report Period

The next report period will be used to evaluate methods and techniques applicable to the printer requirements. Based on this evaluation, a Feasibility Study and Design Analysis report will be prepared. It will contain a detailed analysis of component characteristics and printer configurations.

1.4 Problems

No major problems have appeared during this month nor are expected for next month to cause program delays.

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1.5 Documentation-Contact Duplicating & Reseau Printer

The following list summarizes verbal agreements made with the technical monitors during meetings held in [redacted] Washington on May 21 and July 24, 1964 respectively.

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1.5.1 The Preview and Hole/Slot Punch device will be a separate unit from the Printer and will be operated off-line. The Slot/Hole/Slot pattern will be located along one edge of the negative film and will be variable in length to allow for various frame lengths. Subsequent registration of the punch pattern with the Reseau Grid will be by means of retractable pins located with fixed reference to the Reseau Grid in the Printer. The device shall not be dark-room operable. Negative film will be rewound after punching for loading into Printer. The punch pattern may be aligned with fiducials or at a fixed offset distance from the marks.

1.5.2 Both raw film and negative film will be assumed to be furnished in a "clean" condition and will not require any pre-cleaning or pre-sampling stations to be incorporated in the Printer. Vacuum cleaning of raw film may be provided if determined necessary.

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1.5.3 [redacted] will demonstrate compliance with individual specifications using the best materials for the purpose. Resolution and distortion tests may be made by manual brush-and-tray development which eliminates the variables introduced by commercial film processors. Microscope determination of resolution is acceptable. Any resolution target which can demonstrate 300 lp/mm machine output resolution will be satisfactory. A statistical sample of 30 targets distributed over the platen areas will be sufficient to demonstrate resolution.

1.5.4 Reseau Grid lines will be black on clear glass and will print out white on negative duplicating film. It is recognized that white lines in very light areas may not be discernable. Reseau lines are expected to print out under "normal" exposure conditions. The Reseau glass will be mounted in a frame to facilitate its optional usage in the Printer. Format of Reseau Grid will be $9\frac{1}{2}$" x $30\frac{1}{2}$" to overlap largest frame size anticipated. Printer will operate in automatic mode only when Reseau Grid is not being used. Numbers on grid may be off-line or on-line at our preference. All film widths will be registered to one edge of printing platen.

1.5.5 Skewness of frames on negative film will be no more than 1/32" in a maximum frame length of 30". Allowances for slight rotation of frames to account for skewness will be built into Printer in some form. Frame lengths will not vary on any one roll of film. Frame spacing may vary on negative film within some tolerance limit and are anticipated to be

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sensed for positioning and printing in the automatic mode. Frame spacing on duplicating film will be essentially constant due to predetermined advance of raw film. Border margin of frames from edge of format to edge of image will be 1/4 inch minimum and possibly more for wide films. Border margin of frames from edge of format to edge of image will be 1/4 inch minimum and possibly more for wide films. Specified film widths are 70mm, 5", 6.6", 8", and $9\frac{1}{2}$".

1.5.6 Mask set-up to determine frame size will be done manually for any one roll of film of uniform frame sizes, and may utilize a sheet-roll of masks of various sizes for each specified width of film. The exposure masks may be positioned between films, between films and platen, or below platen. Optimum position to be determined by current testing.

1.5.7 Manual cutting for removal of partially exposed rolls of duplicating film will be acceptable.

1.5.8 Machine operating conditions will be dark-room loading and daylight operating. Film cassettes are not required.

1.5.9 Primary usage of Printer will be to duplicate film. Two-step reversal is not anticipated. Duplicating may be negative-to-positive or positive-to-negative. The possible use of films with anti-halation backing will be verified with photographic suppliers. No clarification has been obtained from the technical monitors concerning film-splice detection, except that "hot splices" are normally used. The Printer will be designed to accommodate usual commercial splices. A large percentage of original negative film will be thin-base 2.5 mil film, and a large percentage of raw film will be 5.5 mil base.

1.5.10 Uniformity of exposure will be checked photometrically at the platen rather than sensitometrically on the film which includes commercial processing variables. A typical range of negative densities has been requested but no firm answer elicited. The only specification suggestion was that with input film density of 2.5, output density must be .05 (above fog) at required printing speeds.

1.5.11 The Printer shall be designed with RFI MIL-SPEC 1748 as a guide, but will not require compliance demonstration. This will permit maximum expenditure of effort upon the prime objectives of high resolution, reliability of operation, and maximum care of original negative film. This will be confirmed by the Technical Monitor.

1.5.12 An Automatic Exposure Control will be required in some degree to accommodate major differences in negative density in long frames. The Printer will have some means of incrementally varying exposure over the length of the frame, whereas variations over the width of frame is not mandatory. An over-ride control on the automatic

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exposure system will be provided. Automatic Exposure Control is required with or without Reseau Grid in place. Automatic dodging is not a requirement of this Printer.

1.5.13 Film cuplication will be on blue-sensitive films only. No panchromatic films are anticipated.

1.5.14 Interlocks will be sufficient to protect operator, machine, and film from damage.

1.5.15 Human Engineering design factors will be applied to the Printer. Color, if any, may be any choice but AF blue. All stainless is desirable for cleanliness. Control panel lights will be controllable for dark-room operation. Any vacuum pumps, air compressors, and auxiliary equipment which might contribute to noise and vibration are preferably to be located separately from the Printer. Air pressure from the facility will be available, and possibly, a vacuum source if required. Printer will operate on either 115 VAC or 208 VAC source, but does not have to operate interchangeably on both. Printer may be stand-up or sit-down operated. Controls will be kept to a minimum for ease of operation and reliability.

1.5.16 The Visual Aids or "Briefing Boards" requested by the technical monitors will be furnished, but are not a contractual obligation.

1.5.17 The Printer will operate in a "clean-room" environment without contributing to contamination of the facility. Heat and exhaust air will be ducted through the floor to outside. Approximate cfm. requirements will be furnished to the monitor as soon as determinable. Facility "clean-air" will be available for input to the Printer. No positive pressure within Printer is allowable.

1.5.18 Size limitations of the Printer have been related to installation restrictions. Ceilings will be 10.5 ft., freight elevators 10 ft. wide, double doors of 5 ft. width, typical floor loading of 150#/sq. ft., and halls of 8 ft. wide.

1.5.19 Rewind of negative film is required in both directions, both high and low speed. Duplicating film will wind in one direction only. Coding will not be required on negative film, or Printer recognition of any coding. Choice of frames to be determined by operator, as well as number of multiple prints. Usual operation of Printer will be one print per negative frame. Interchangeable kits for various film widths are not desirable.

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2. HIGH RESOLUTION STEP AND REPEAT PRINTER

2.1 Purpose

The purpose of this effort is to design, fabricate, test, and deliver in twenty months a high-precision, step and repeat photographic contact printer. This printer will be capable of producing photographic contact prints of the highest possible quality, resolution and acutance, from roll film of widths varying from 70mm to $9\frac{1}{2}$" and in pre-selected frame lengths from $2\frac{1}{4}$" up to a maximum of 30"/

The program will include a six-month Feasibility Study and Design Analysis, followed by a Breadboard Phase. Following design approval, a Prototype printer will be produced in accordance with the design plan.

2.2 Activity of this Report Period

A project team has been organized. During this period, the study was outlined in task form and the tasks were analyzed in terms of inter-relationship and time phasing. Manpower estimates were made for the various tasks by both the project engineer and the task assignees. From this, a six-month schedule for the Feasibility Study was developed.

A preliminary control panel configuration was established and studies were initiated in order to create an artist's concept. A PERT diagram was prepared and is under analysis to define the critical paths.

A technical meeting was held on Julu 24, 1964, with the government monitor in Washington, and a number of decisions were obtained.

A project design review meeting is scheduled for August 14, 1964.

2.3 Plans for Next Report Period

2.3.1 Continue analysis and definition of task areas

2.3.2 Expand PERT chart to include entire program

2.3.3 Continue feasibility study research

2.3.4 Outline preliminary list of probable mock-ups required in first phase study.

2.4 Problems

No major problems have appeared during this month nor are expected for next month to cause program delays.

2.5 Documentation - Step & Repeat Contact Printer

As a result of the meetings held with the Technical Monitor and a preliminary study of the program requirements, the following agreements were made:

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2.5.1 Specific film format dimensions and appropriate Mil standard spool numbers will be furnished by the Technical Monitor.

2.5.2 Areas outside of film format requiring reproduction will be defined by the Technical Monitor.

2.5.3 None of the representative film types to be handled will have perforations.

2.5.4 Films to be reproduced will be primarily reconnaissance type subject matter.

2.5.5 Film coding may be permanent.

2.5.6 Machine dimensions should not exceed 6'6" in height and should be capable of passing through 5' doors. Concrete floor loading is 150 lbs./ft.^{2}

2.5.7 Negative stock will be furnished pre-cleaned, however, raw film stock should be vacuum cleaned before it enters the film gate. If required, raw stock may be cleaned prior to installation.

2.5.8 Printer will have rewind capabilities for negative stock, but not for raw stock. Rewind capabilities do not have to be at 100 ft/minute, but should be within a reasonable time.

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2.5.9 Film encoding equipment design and manufacture is not [redacted] responsibility. A meeting will be held soon to determine characteristics of code read-out equipment in machine.

STAT 2.5.10 [redacted] may demonstrate machine capabilities separately on any chosen film; as for example, SO-105 for resolution and #8430 for speed.

2.5.11 Resolution and distortion film tests may be processed by manual brush-and-tray or other [redacted] chosen method to eliminate variables introduced by commercial film processors.

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2.5.12 Tape or memory system is not desirable for exposure control. Full-frame light averaging is undesirable for exposure control. Technical Monitor will attempt to describe limits of over-and-under exposure for which machine shall properly compensate.

2.5.13 Film transport without damage and ultimate resolution are the prime factors to be considered.

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2.5.14 "Briefing Board" or artist's conception of the machine and mattes indicating prime design objectives to be furnished within 1 to 2 months. This is not a contractual requirement.

2.5.15 All film duplication will be on blue-sensitive films only. No panchromatic films will be used.

2.5.16 Machine to be complete with self-contained air and vacuum system.

2.5.17 Machine to be darkroom loading and daylight operating. No film cassettes or magazines to be furnished.

2.5.18 Machine to have cleanroom interior. Environmental clean-room air may be drawn into machine for temperature and humidity interior control. Exhause air to be vented out-side of clean room facility.

2.5.19 Vent to be located toward the room ceiling.

2.5.20 Uniformity of exposure may be checked photometrically at the gate to eliminate the variables of film processing.

2.5.21 High contrast, high resolution test targets will be difficult if not impossible to obtain. It will, therefore, be adequate if we can demonstrate 400 lines/mm resolution with a low to medium contrast target of lower resolution.

2.5.22 Resolution tests will be checked by means of a microscope rather than a microdensitometer.

2.5.23 A study of the prime requirements set forth for black and white film transparencies has led to the elimination of opaque color and black and white print materials. The primary objection is the probably generation of lint and dust which could have a serious and deleterious effect upon black-and-white film transparency resolution.

2.5.24 A study of the prime requirements set forth for black and white film transparencies has led to the elimination of standard color films balanced for daylight and/or incandescent illumination as a machine requirement. The primary objection is the requirement of a broadband light source, which will result in lower efficiency for black and white application. Additional compromises to black and white operation are:

a. Generation of excessive internal heat due to broadband lamp requirements.

b. Requirement of 3 photocells for exposure control resulting in added complexity and reduced machine reliability.

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2.5.25 MIL-S-11748 may be used as a design objective and may not require demonstration by test. This will permit the maximum effort to be expended upon the prime objectives of attainment of the ultimate in resolution and film transport without damage. This will be confirmed by the Technical Monitor.

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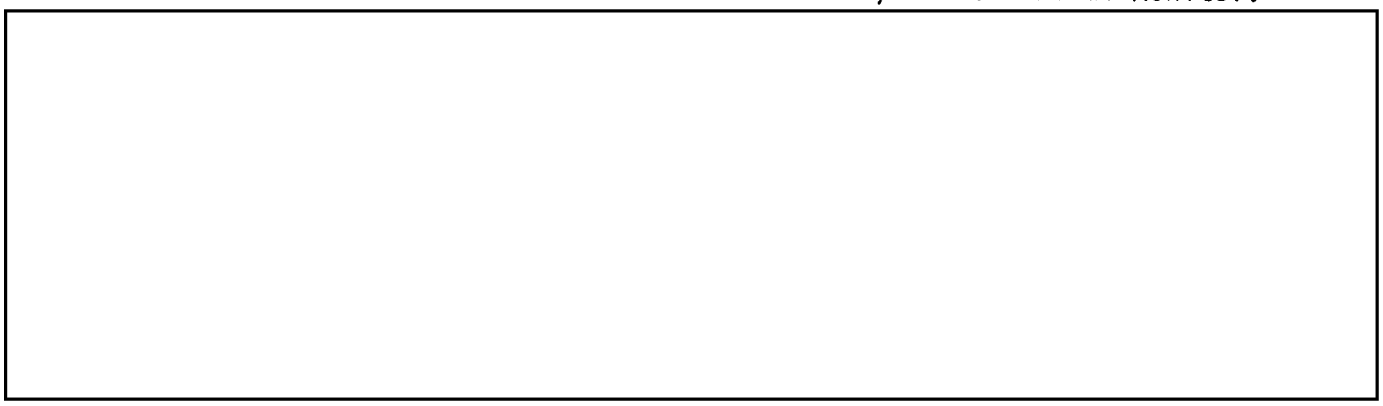

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